Index of Refraction Lab

10 points

You are given two blocks, each of an unknown substance. Medium 1 is more dense than air and medium 2 is more dense than medium 1. They are connected together as shown below.

Material 1

Material 2

1. List the materials that you would need besides the unknown material in order to find the indices of refraction and therefore the identities of the materials.
2. Draw the set-up that you would use, labeling all of the components.
3. Briefly describe the procedure that you would use in order to find the indices of refraction. Show the equation(s) that you would use in your calculations and identify all variables.
4. Solve for the indices of refraction in terms of variables, using 1 as the index of refraction for air.

**Solution**

1. Laser and protractor.

Ѳ1

Material 1

Material 2

Ѳ2

Ѳ3

Ѳ4

n1

n2

n3

1. Shine the laser through the first medium, measuring the angle of incidence (Ѳ1) and the angle of refraction (Ѳ2). Continue by measuring the angle of refraction through the second medium (Ѳ3) and the angle of refraction (Ѳ4) back into air. Calculate the indices of refraction for each medium using the equation n1sinѲ1 = n2sinѲ2.
2. n1sinѲ1 = n2sinѲ2 n3sinѲ3 = n1sinѲ4

n2 = sinѲ1/sinѲ2 n3 = sinѲ4/sinѲ3

**Rubric**

1. Points awarded for materials list.
   1. Laser 1 point
   2. Protractor 1 point
2. Points awarded for diagram.
   1. For all components being present and labeled. 1 point
   2. For all rays being drawn correctly, with incident 1 point

angles measured with respect to the normal.

1. Points awarded for procedure.
   1. For shining the laser through the first medium 1 point

at an angle other than 90 degrees.

* 1. For measuring angles of incidence. 1 point
  2. For including the correct equation, n1sinѲ1 = n2sinѲ2 1 point

1. Points awarded for solution.
   1. Correct substitution. 1 point
   2. Solved for index of refraction, n1. 1 point
   3. Solved for index of refraction, n2. 1 point